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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE
BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

In re application of	:	Attorney Docket No. 2009_1799
Keijo J. KINNARI et al.	:	**Confirmation No. 9109**
Serial No. 10/561,151	:	Group Art Unit 3742
Filed September 25, 2006	:	Examiner Sang Yeop Paik
METHOD AND SYSTEM FOR DIRECT ELECTRIC HEATING OF A PIPELINE	:	**Mail Stop: APPEAL BRIEF-PATENTS**

APPEAL BRIEF

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

The following is Appellant's Brief, submitted under the provisions of 37 C.F.R. § 41.37. The fee of $540.00 required by 37 C.F.R. § 41.20 is enclosed (see the attached credit card payment form).

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The USPTO is hereby authorized to charge any fees under 37 C.F.R. §§ 1.16, 1.17, and 1.492, which may be required by this paper to Deposit Account No. 23-0975.

REAL PARTY IN INTEREST.

The real party in interest is Statoil ASA, the assignee of record (Reel/Frame: 023833/0500).

RELATED APPEALS AND INTERFERENCES

There are no related appeals and interferences.

STATUS OF CLAIMS

Claims 2, 5, 8, 9, 10, 11, 12 and 14 are currently pending in the present application and each of these claims are rejected over the prior art. The rejections of claims 2, 5, 8, 9, 10, 11, 12 and 14 are being appealed. A complete copy of claims 2, 5, 8, 9, 10, 11, 12 and 14 is provided in the attached Claims Appendix.

STATUS OF AMENDMENTS

There were no amendments to the claims submitted after the final rejection of October 14, 2010.

SUMMARY OF CLAIMED SUBJECT MATTER

A description of the subject matter of the rejected claims is presented below. All references to the specification refer to the specification as originally filed.

The subject matter of independent claim 5 is directed to a method for removing plugs of at least ice in a subsea pipeline (1), which is electrically conductive, exhibits ohmic resistance,

and is a conduit for a fluid. The method includes the steps of directly heating the pipeline electrically to a temperature above the melting point of ice, but below the melting point of a hydrate (page 2, lines 18-19; original claim 1); applying an electrical voltage over the pipeline between two electrical contacts, thereby causing an electric current to pass through the pipeline to resume or maintain flow of fluid through the pipeline (page 2, line 36 to page 3, line 7); and subsequently applying a second plug-counteracting procedure to remove any ice or hydrate plug from within the pipeline (page page 3, lines 30-34).

Claim 2 further defines the method recited in claim 5, and recites applying the electrical voltage over the pipeline between the electrical contacts until a zone of ice having a thickness of at least 5 mm closest to an inner wall of the pipeline melts, such that flow of the fluid through the pipeline is resumed or maintained (page 4, lines 1-5).

Claim 14 further defines the method of claim 5, and recites that the electrical voltage applied over the pipeline between the electrical contacts is sufficient to melt only part of the ice plug closest to an inner wall of the pipeline, the part of the ice plug forming a zone having a thickness of at least 5 mm closest to the inner wall of the pipeline to allow the flow of the fluid through the pipeline to be resumed or maintained (page 4, lines 11-24).

The subject matter of claim 10 is directed to a system (see Fig. 1) for removing plugs of at least ice in an electrically conductive subsea pipeline (1). The system includes an electrical current source (page 2, lines 29-31 and page 4, lines 6-9); a support device (surface vessel 2) supporting the current source; and a first subsea electrical connector (6) and a second subsea electrical connector (6; page 2, lines 34-36). Each of the electrical connectors are in electrical contact with the pipeline (page 2, lines 35-36). The system also includes a riser cable (3) that extends between the support device and the pipeline (1). The riser cable includes first and

second electrical conductors (4) for conducting electrical current between the electrical current source to a respective one of the first and second subsea electrical connectors. An electric circuit is formed from the electrical current source, through the first electrical conductor, over the first subsea electrical connector, through the pipeline, over the second subsea electrical connector, and through the second electrical conductor back to the current source (see page 2, line 36 to page 3, line 5).

The electrical current source is provided for generating current sufficient to cause heating of the pipeline to a temperature above the melting point of ice, but below the melting point of a hydrate, such that the permeability through the pipeline is resumed or maintained, and so as to enable a second plug-counteracting procedure for plug removal or hindrance of ice and hydrate plug formation (see page 3, lines 19-23).

Claim 11 further defines the system of claim 10 and recites that the electrical current source is provided for generating current sufficient to melt a zone of ice having thickness of at least 5 mm closest to an inner wall of the pipeline, such that flow of the fluid through the pipeline is resumed or maintained (page 4, lines 11-24).

GROUNDS OF REJECTION TO BE REVIEWED ON APPEAL

Claims 2, 5, 8-11 and 14 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent Application Publication No. 2002/0028070 (hereinafter "the Holen publication") in view of U.S. Patent Application Publication No. 2004/0253734 (hereinafter "the Firmin publication") or U.S. Patent Application Publication No. 2003/0178195 (hereinafter "the Agee publication"). Also, claim 12 stands rejected under 35 U.S.C. § 103(a) as being unpatentable over the Holen publication in view of the Firmin or Agee publications and further in view of U.S. Patent No. 6,328,523 to Ness et al. (hereinafter the "Ness patent").

ARGUMENT

The present invention, as defined in independent claim 5, is directed to a method for removing plugs of at least ice in a subsea pipeline. The method requires:

(i) directly heating the pipeline electrically to a temperature above the melting point of ice, but below the melting point of a hydrate;

(ii) applying an electrical voltage over the pipeline between two electrical contacts, thereby causing an electric current to pass through the pipeline to resume or maintain flow of fluid through the pipeline; and

(iii) subsequently applying a second plug-counteracting procedure to remove any ice or hydrate plug from within the pipeline.

Prior art systems for direct electric heating function according to design but are far too expensive for use with pipelines that are located at large depths or have a small amount of thermal insulation. The present invention employs direct heating of the pipeline to a temperature above the melting point for ice but below the melting point for hydrates. Then a second plug-counteracting procedure (such as chemical injection and depressurization) is applied to remove the remaining ice and hydrates.

I. Rejection of Independent Claims 5 and 10 under 35 U.S.C. 103(a) as being unpatentable over the Holen publication in view of the teachings of the Firmin publication or the Agee publication.

In the final rejection of claims 5 and 10, the Examiner acknowledges that the Holen publication lacks any disclosure of heating the pipeline electrically to a temperature above the melting point of ice, but below the melting point of a hydrate, and subsequently applying a

second plug-counteracting procedure. In an attempt to cure the deficiencies of the Holen publication, the Examiner applies the Firmin publication to teach that it is known in the art to use "chemical injection as well as the pressurization system to remove a hydrate plug" and the Agee publication to show "a known means of depressurization to remove a hydrate plug or ice" (see final Office Action at page 2). It should be noted that Appellant's originally-filed specification explains that a commonly used method of avoiding plugging by hydrates and/or ice in pipelines includes adding chemicals to the hydrocarbon flow (see "Background of the Invention and Prior Art" on page 1). Also described in Appellant's specification is a method of depressurization to remove hydrate plugs in pipelines. Thus, Appellant concedes that plug-counteracting procedures per se, such as chemical injection and depresssurization, are known in the art.

1. The Proposed Combination

The Holen publication discloses a system for heating a thermally insulated pipeline in order to prevent the formation of hydrate plugs or wax deposits when crude oil transportation is stopped. However, even if a person of ordinary skill in the art had considered the Holen system when attempting to solve the problem of removing ice plugs from subsea pipelines, the result would be a solution in which the pipeline is heated to a temperature sufficient for melting both ice plugs and hydrate plugs. There is no disclosure or suggestion in Holen that would have led a person of ordinary skill in the art to modify its teachings so as to limit the heating of the pipeline to below the melting point of a hydrate, as specifically required in claims 5 and 10.

Further, Holen discloses that the heating of a pipeline will successfully prevent the formation of hydrate plugs. Thus, a person of ordinary skill in the art would not have considered limiting the degree of heating as this would not achieve the stated purpose of the Holen system,

i.e. preventing the formation of hydrate plugs. Furthermore, in the Holen system, there would have been no reason for the subsequent application of a second plug counteracting procedure because such a procedure would be unnecessary as plug formation is effectively prevented. Thus, a person of ordinary skill in the art would not have considered alternative solutions, such as those disclosed in Firmin and Agee, to prevent hydrate plug formation. Clearly, the Firmin and Agee solutions would have no application in the environment of Holen. Thus, it is clear that there would have been no reason to combine the heating solution of Holen with the alternative solutions disclosed in Firmin and Agee.

On page 3 of the Office Action, the Examiner states that:

> *"In view of Firmin or Agee, it would have been obvious to one of ordinary skill in the art to adapt Holen with a procedure the combination of, or in sequence of, heating and application of the chemical injection or depressurization to **enhance the removing of a hydrate plug or ice in the pipeline to facilitate a more effective flow in the pipeline.**"* (emphasis added)

Apparently the Examiner is suggesting that the addition of the Firmin or Agee procedures would "facilitate a more effective flow in the pipeline." However, it is unclear how this would occur because the Holen system successfully prevents the formation of hydrate plugs. Thus, additional procedures for removing hydrate plugs would have no application in the Holen system. The Examiner's conclusion that additional procedures would "facilitate a more effective flow in the pipeline" is simply a conclusory statement that happens to be clearly factually incorrect. There is no evidence on the present record that would suggest that the addition of the Firmin or Agee procedures would provide any benefit such as "enhancing" the removal of a hydrate plug or ice. The Examiner's articulated reasoning in the rejection must possess a rational underpinning to support the legal conclusion of obviousness. *In re Kahn*, 441 F.3d 977, 988, 78 USPQ2d 1329, 1336 (Fed. Cir. 2006). In this case the Examiner has clearly failed to provide any reasoning that would support the legal conclusion of obviousness.

Further, the present invention, as defined in claims 5 and 10, requires that the pipeline is only heated to a temperature sufficient to melt ice formations, thereby enabling the application of a second plug counteracting procedure (e.g. such as chemical injection or depressurization) which would not have been possible when ice plugs are present. By requiring only limited heating of a subsea pipeline, the present invention provides that both ice and hydrate plugs can be removed without the expense and implementation difficulties involved in heating a pipeline to a temperature sufficient to melt both hydrate and ice plugs.

In particular, claim 5 requires, *inter alia*, the step of "directly heating the pipeline electrically to a temperature above the melting point of ice, but **below** the melting point of a hydrate." The Examiner dismisses this limitation as a "matter of routine experimentation" (Office Action, page 4). However, in the present invention, the heating of the pipeline is limited for a particular reason which is not applicable in the prior art system. Furthermore, it is noted that Holen explicitly requires heating the pipeline to a temperature that is sufficient to prevent the formation of hydrate plugs or wax deposits. Thus, it is essential in the Holen system that the temperature be above the melting point of a hydrate. Clearly the Holen reference does not disclose or suggest limiting the temperature as required in claim 5.

In view of the above, it is clear that any modification of the Holen method to lower the temperature would destroy the intended purpose of the Holen heating system. As instructed in MPEP 2145.01V, if a proposed modification would render the prior art invention unsatisfactory for its intended purpose, then there is no reason to make the proposed modification. Clearly, there is no suggestion or reason to modify the Holen method as proposed by the Examiner.

2. Response to the Examiner's "Response to Arguments"

In the final Office Action, the Examiner argues that Holen merely discloses that heating is provided so as to keep the viscosity of the oil in the pipeline low when transport of oil is stopped, such that the pipeline would only need to be heated to above the temperature required to melt ice. However, the Examiner is incorrect.

In order to keep the viscosity of the oil in the pipeline low, it is necessary to heat the pipeline to a temperature sufficient to prevent the formation of hydrate plugs and wax deposits (see Holen; paragraphs 0003, 0014 and 0015). Merely heating the pipeline to above the temperature required to melt ice will not be sufficient to prevent hydrate plugs and wax deposits from forming. In paragraph 0014, Holen states that "plugs and remaining cold crude oil in the section 6 will block new oil transportation because of its higher viscosity in spite of the thermal insulation of the metallic tube 1." Thus, any application of the Holen teachings would require heating the pipeline to a temperature above the melting point of a hydrate.

Further, there is no reason to modify the Holen system with a second plug counter-acting procedure. As discussed above, the Holen publication explains that the disclosed method prevents the formation of hydrate plugs or wax deposits (see paragraphs 0014 and 0015).

The inventions defined in claims 5 and 10 provide that a pipeline need only be heated to a temperature sufficient to melt ice formations, thereby enabling the application of a second plug counter-acting procedure that would not have otherwise been possible when ice plugs are present. By requiring only limited heating of a subsea pipeline, the present invention provides that both ice and hydrate plugs can be removed without the expense and implementation difficulties involved in heating a pipeline to a temperature sufficient to melt both hydrate and ice plugs.

II. Rejection of Claims 2 and 14 under 35 U.S.C. 103(a) as being unpatentable over the Holen publication in view of the teachings of the Firmin publication or the Agee publication.

Dependent claim 2 requires applying the electrical voltage over the pipeline between the electrical contacts until a zone of ice having a thickness of at least 5 mm closest to an inner wall of the pipeline melts, such that flow of the fluid through the pipeline is resumed or maintained (page 4, lines 1-5).

Dependent claim 14 requires that the electrical voltage is applied over the pipeline between the electrical contacts is sufficient to melt only part of the ice plug closest to an inner wall of the pipeline, the part of the ice plug forming a zone having a thickness of at least 5 mm closest to the inner wall of the pipeline to allow the flow of the fluid through the pipeline to be resumed or maintained (page 4, lines 11-24).

The Examiner's rejection does not address the specific limitations of claims 2 and 14, and thus the Examiner has not set forth a rejection that supports the legal conclusion of obviousness. It should be noted that the Holen publication does not contemplate partial melting of an ice plug. In the present invention, as defined in claims 2 and 14, the partial melting (of at least 5 mm) ensures flow over the plug so that the remaining ice and hydrates can be removed by chemical injection or depressurization.

CONCLUSION

In view of the above, it is submitted that the prior art combination proposed by the Examiner does not establish a proper basis for the rejection of claims 2, 5, 8-12 and 14. Therefore, the Examiner's decision to finally reject claims 2, 5, 8-12 and 14 under 35 U.S.C. 103(a) should be reversed.

Respectfully submitted,

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CLAIMS APPENDIX

2. A method according to claim 5, further comprising applying the electrical voltage over the pipeline between the electrical contacts until a zone of ice having a thickness of at least 5 mm closest to an inner wall of the pipeline melts, such that flow of the fluid through the pipeline is resumed or maintained.

5. A method for removing plugs of at least ice in a subsea pipeline, which is electrically conductive, exhibits ohmic resistance, and is a conduit for a fluid, the method comprising:

directly heating the pipeline electrically to a temperature above the melting point of ice, but below the melting point of a hydrate;

applying an electrical voltage over the pipeline between two electrical contacts, thereby causing an electric current to pass through the pipeline to resume or maintain flow of fluid through the pipeline; and

subsequently applying a second plug-counteracting procedure to remove any ice or hydrate plug from within the pipeline.

8. A method as in claim 5, in which the second plug-counteracting procedure is chemical injection.

9. A method as in claim 5, in which the second plug-counteracting procedure is depressurization.

10. A system for removing plugs of at least ice in a subsea pipeline, which is electrically conductive, exhibits ohmic resistance, and is a conduit for a fluid hydrocarbon, which pipeline can be blocked by plugs of ice and hydrates, the system comprising:

an electrical current source;

a support device supporting the current source;

a first subsea electrical connector and a second subsea electrical connector, each of said electrical connectors being in electrical contact with the pipeline; and

a riser cable that extends between the support device and the pipeline, said riser cable comprising a first electrical conductor and a second electrical conductor for conducting electrical current between the electrical current source to a respective one of the first and second subsea electrical connectors, wherein an electric circuit is formed from the electrical current source, through the first electrical conductor, over the first subsea electrical connector, through the pipeline, over the second subsea electrical connector, and through the second electrical conductor back to the current source,

wherein the electrical current source is provided for generating current sufficient to cause heating of the pipeline to a temperature above the melting point of ice, but below the melting point of a hydrate, such that the permeability through the pipeline is resumed or maintained, and so as to enable a second plug-counteracting procedure for plug removal or hindrance of ice and hydrate plug formation.

11. A system as in claim 10, in which the electrical current source is provided for generating current sufficient to melt a zone of ice having thickness of at least 5 mm closest to an inner wall of the pipeline, such that flow of the fluid through the pipeline is resumed or maintained.

12. A system as in claim 10, in which the support device is a surface vessel that is equipped to extend the riser cable down to the pipeline for connection of the first electrical conductor and a second electrical conductor to the respective first subsea electrical connector and the second subsea electrical connector.

14. A method according to claim 5, wherein the electrical voltage applied over the pipeline between the electrical contacts is sufficient to melt only part of the ice plug closest to an inner wall of the pipeline, the part of the ice plug forming a zone having a thickness of at least 5 mm closest to the inner wall of the pipeline to allow the flow of the fluid through the pipeline to be resumed or maintained.

EVIDENCE APPENDIX

None

RELATED PROCEEDINGS APPENDIX

None